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Witness the Trinity test through Lab artifacts

Get a close-up look at one of the Atomic Age architects and the novel substance created at the site

By the [National Security Research Center](#) staff

July 16 marks the 77th anniversary of the Trinity test, conducted in a desert in New Mexico. The test subject, an atomic bomb [called The Gadget](#), was successfully detonated from a 100-foot steel tower. This event marks the commencement of the Atomic Age, a new era where fission capabilities could be employed for national security purposes.

Shortly after the Trinity test, two Los Alamos-created atomic weapons were released above Japan, helping to end the world's bloodiest conflict just weeks later.

"Trinity was one of the greatest scientific experiments ever," said NSRC Senior Historian **Alan Carr** said. "Los Alamos scientists changed the world forever on that day. Not only was it the dawn of the Atomic Age, but also the beginning of the Lab's eight decades of cutting-edge science and its national security charge."

To preserve this event, and to continue to learn more about this critical moment in history, the National Security Research Center (NSRC) curates a collection of photographs, films, notes, unclassified artifacts and numerous other materials related to the science of the test. Notably, the collection includes a novel material that formed at the site, trinitite, and artifacts from one of the intriguing scientists present at the test, Enrico Fermi.

Find out more about a few of the most fascinating objects below, which are on display in the NSRC.

"Although these relics related to the Trinity test are unclassified, they're located in a classified area," said **Danny Alcazar**, NSRC archivist. "It's great to be able to share their images with the Lab staff. They represent an event that is arguably one of the greatest scientific accomplishments of all time, plus remind us that the organization we work for has an incredible legacy."

[Trinitite](#)



https://drive.google.com/file/d/1_w-mTdzxD777NmNzt0Osinmj7Q62tdLx/view?usp=sharing

caption: Trinitite is a glassy substance that formed as heat from the 1945 Trinity test fused the desert sand.

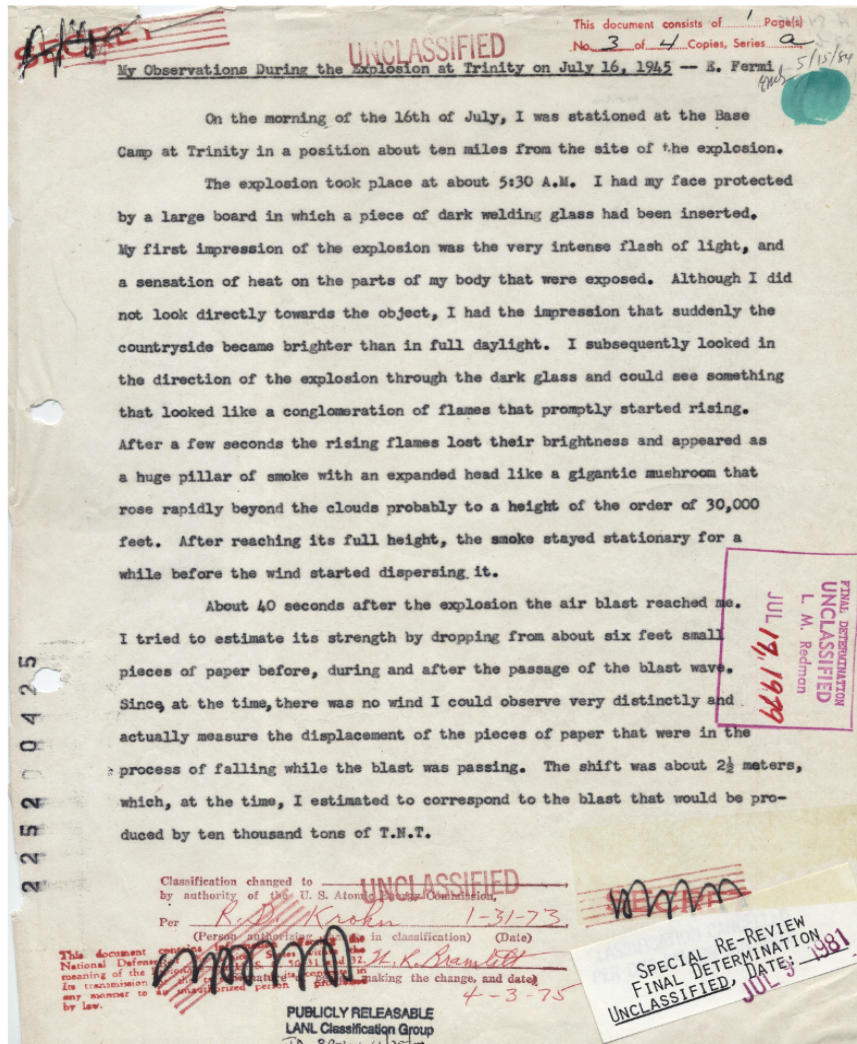
Also called atomsite or Alamogordo glass (after the nearby city), trinitite is a glass-like material formed when the intense energy of the Trinity test transformed the surrounding sand and other materials. This fascinating new substance, samples of which can also be found in well-known museums worldwide, gives us a direct connection to this momentous event.

Trinitite formed from the distinct conditions created by The Gadget's detonation. The immense force of the explosion and the 15,000-degree Fahrenheit heat combined with the surrounding desert sand to form a jade-green glass.

In his 2021 article "Thirty Minutes Before Dawn," Carr writes that "the radioactive material would attach itself to the dirt: smaller particles would rise into the atmosphere in the form of smoke and heavier, molten particles would quickly fall back to the surface. Once on the surface, the molten material solidified as temperatures cooled, forming the greenish, glasslike mineral trinitite."

This unique substance has been collected by visitors to the Trinity site as souvenirs, but this is now prohibited. Actor Charlton Heston, who was a World War II veteran and Lab-clearance holder, was given a piece of trinitite, which he called [his son's birthstone](#).

Fermi's notes



https://int.lanl.gov/news/_assets/pdfs/2019/0716-fermi-observations.pdf

Physicist and Nobel laureate [Enrico Fermi](#) was among the scientists who witnessed the Trinity test. His notes (**picture above**), which are part of the NSRC's unclassified collections, give us insight into what he was thinking during and after the test.

"Fermi's observations aren't dated, but were likely written shortly after the test," Carr said. "They're fascinating and just one of quite literally thousands of incredible pieces of the Lab's history that we have in the NSRC."

Fermi conducted a small experiment of his own while the test took place, estimating the output of the explosion by means of simple materials he had at hand: "About 40 seconds after the explosion, the airblast reached me. I tried to estimate its strength by dropping from about six feet small pieces of paper before, during, and after the passage of the blast wave... The shift was about 2½ meters, which, at the time, I estimated to correspond to the blast that would be produced by ten thousand tons of TNT," he wrote.

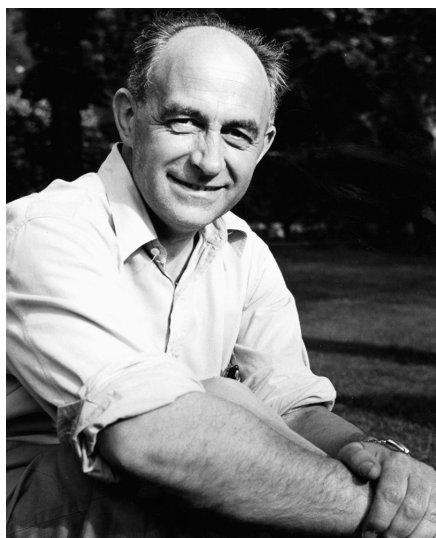
The test proved even more immense: “At the equivalent of 21,000 tons of TNT, the blast was larger than Fermi’s estimate,” Carr said, adding, “but he wasn’t that far off, which is pretty incredible considering he only had a piece of paper.”



<https://int-nsrc.lanl.gov/assets/posters/the-trinity-test.pdf>

caption: The NSRC illustrated [a poster](#) depicting Fermi’s informal experiment, which can be printed and displayed.

Fermi’s one-of-a-kind portrait, badge photo



Caption: Harold Agnew, a scientist, Enrico Fermi's student, and third Lab director, took this photo of Fermi. Agnew declared it one of the best photos of Fermi ever taken.

<https://drive.google.com/file/d/1XyUsKNy3uK5udMqsJDhue3A65IPdtepQ/view?usp=sharing>

The NSRC's collections includes a one-of-a-kind photo of Fermi. The black-and-white portrait was taken by his fellow Manhattan Project scientist and student Harold Agnew. Agnew would go on to become the Lab's third Director. The portrait, along with hundreds of [never-before-seen photos and documents](#), were a part of Agnew's personal collections and were recently donated to the NSRC by Agnew's son.



Caption: Enrico Fermi's badge photo.

<https://drive.google.com/file/d/1ouAXmCbOiPtkitiDkbtP8kfLLNR9SelD/view?usp=sharing>

Meanwhile, staff badge photos from the Manhattan Project served the purpose of maintaining security at the secret laboratory in Los Alamos. Today, they preserve the faces of the scientists, among others, who brought the world into the Atomic Age. Fermi's badge photo gives us a glimpse of the human side of a brilliant mind who, as a contributor to the Manhattan Project and creator of the world's first nuclear reactor, has been called the "architect of the nuclear age."

Looking for more?

- To learn more about the Trinity test and the Lab's fascinating history, check out stories, photos, and videos at int-nsrc.lanl.gov.
- Immerse yourself in the sounds, voices, and images of the events and history surrounding the Trinity test with these NSRC-created films: [Trinity Test 75th Anniversary](#), [The Science of Trinity](#), [Overview of the Trinity Test](#) and [Trinity and the British Mission](#).
- Commemorative posters can be downloaded, printed and displayed:

TRINITY SCIENTIFIC FIRSTS

THE TRINITY TEST was perhaps the greatest scientific experiment ever. Seventy-five years ago, Los Alamos scientists and engineers from the U.S., Britain, and Canada changed the world. July 16, 1945 marks the entry into the Atomic Age.

PLUTONIUM:
Scientists confirmed the newly discovered ²³⁹Pu has attractive nuclear fission properties for an atomic weapon. They were able to discover which production path would be most effective based on nuclear chemistry and separated plutonium from Hanford reactor fuel.

PRECISION HIGH-EXPLOSIVE IMPLUSION TO CREATE A SUPER-CRITICAL ASSEMBLY:
Project Y scientists developed simultaneously-exploding bridgewire detonators with a pioneering high-explosive lens system to create a symmetrically convergent detonation wave to compress the core.

ADVANCED IMAGING TECHNIQUES:
Complementary diagnostics were developed to optimize the implosion design, including flash x-radiography, the Rada method, the magnetic method, pips, and laser-scatterer gamma rays.

CRITICAL ASSEMBLY EXPERIMENTS:
These determined the critical masses of uranium, plutonium, and tamper materials for the design of the weapon and validated an understanding of the neutron chain reaction.

THE ORIGINS OF STOCKPILE SAFETY:
Project Y scientists designed relatively simple safety features, such as fuzing plugs and insurable cores, into wartime nuclear weapons. These innovations would inspire more complex and entirely reliable safety technologies in future weapons.

PLUTONIUM ALLOYING AND METALLURGY:
Methods were successfully developed to purify the metal and create a dimensionally stable plutonium alloy that enabled the machining of the Gadget's core.

THE BETHE-FEYNMAN FORMULA:
Nobel Laureates Hans Bethe and Richard Feynman developed the physics equation used to estimate the yield of a fission weapon, building on earlier work by Otto Frisch and Rudolf Peierls. The equation elegantly encapsulates essential physics involved in the nuclear explosion process.

FOUNDATIONAL RADIOCHEMICAL YIELD ANALYSIS:
Wartime radiochemistry techniques developed and used at Trinity provide the foundation for subsequent analyses of nuclear detonations, both foreign and domestic.

NEW FRONTIERS IN COMPUTING:
Human computers and IBM punched-card machines together calculated hydrodynamics, instabilities, and neutronics algorithms that began the modern era of multi-physics simulations.

THE DAWN OF THE ATOMIC AGE:
Trinity verified fission could be harnessed in the form of a revolutionary weapon: about 6 kilograms of plutonium yielded an equivalent of 21,000 tons of TNT. The use of nuclear weapons helped bring World War II to an abrupt and victorious conclusion. Today, the atom provides clean energy and enhanced national security.

"We knew the world would not be the same. A few people laughed, a few people cried, most people were silent."
— J. Robert Oppenheimer, Lab director and physicist

"We were struck by an even stronger feeling that the faith of those who had been responsible for the initiation and the carrying on of this fissionism project had been justified."
— Gus Leslie Gross, leader of the Plutonium Project

"Some people claim to have wondered at the time about the future of mankind. I didn't. We were at war, and the damned thing worked."
— Norris Bradbury, physicist

"I am sure that all who witnessed this test went away with a profound feeling that they had seen one of the great events of history."
— Edwin McMillan, physicist

"I am about the only guy who actually looked at the damn thing!"
— Robert Serber, physicist who witnessed the Trinity test without wearing the safety glasses he was given

"The one who saw it could forget it, a hard and awesome display."
— Kenneth Bainbridge, Trinity test director

"Although I had lived through this moment in my imagination many times during the past few years and everything happened almost as I had pictured it, the reality was shocking."
— James Chadwick, head of the British delegation to the Plutonium Project in Los Alamos

"The spectacle was tremendous, beautiful, magnificent, terrifying, exciting, humbling, scary!"
— Maria G. Bredes, secretary at the Los Alamos Lab

"Oppie, you owe me \$10."
— George Kistiakowsky, physical chemist, who requested a month of his salary against Oppenheimer's \$10 that the Gadget would work

TRINITY REACTIONS

nsrc@lanl.gov

A few hundred scientists, engineers and military gathered in the New Mexico desert during the early morning hours of July 16, 1945. It was the culmination of years of work at the secret lab in Los Alamos led by J. Robert Oppenheimer.

The Trinity test was the world's first detonation of a nuclear weapon. Ranging from vividly descriptive to deeply profound to a little corny, those who witnessed this scientific achievement had their own impressions of what they had just seen.

NATIONAL SECURITY RESEARCH CENTER
LOS ALAMOS NATIONAL LABORATORY

caption: Seventy-seven years ago the world entered the Atomic Age with the successful detonation of The Gadget in the New Mexico desert known as the Trinity test. You can print your own commemorative poster of [Trinity's scientific firsts](#) and [scientists' reactions to the successful detonation](#).